Strategies Applying to Flooding Hazards –	Multi-Jurisdictional Local Hazard Mitigation Plan (LHMP) Policy Number
While it is the responsibility of flood control districts to plan for essential flood control projects, as well as to construct and maintain those structures, cities and counties can help these districts in their efforts. This cooperation is particularly essential for city-maintained roads and other facilities. Some opportunities for mitigation strategies include –	
1) Assist, support, and/or encourage the U.S. Army Corp of Engineers, various Flood Control and Water Conservation Districts, and other responsible agencies to locate and maintain funding for the development of flood control projects that have high cost-benefit ratios (such as through the writing of letters of support and/or passing resolutions in support of these efforts). **For example, you can support levee maintenance efforts!**	INFR-d-4
2) Elevate critical bridges affected by flooding to increase stream flow and maintain critical access and egress routes.	INFR-d-11
3) Provide a mechanism to expedite the repair or replacement of levees that are vulnerable to collapse from earthquake-induced shaking or liquefaction, rodents, and other concerns, particularly those protecting critical infrastructure. **Again, help in providing a mechanism for retrofitting or replacing these structures might include writing letters in support of state or federal legislation or seeking funding for retrofit of structures owned by your local government.** Levees include not only levees in the Bay/Delta system, but also along channels and canals. Typical maintenance will deal with rodent control, repair of isolated slide sites and de-silting. All of this type of work abates problems in the future.	INFR-d-12 INFR-d-13 INFR-d-15
4) Ensure that utility systems in new developments are constructed in ways that reduce or eliminate flood damage.	INFR-d-16
5) Work cooperatively with water agencies, flood control districts, Caltrans, and local transportation agencies to determine appropriate performance criteria for watershed analysis.	
6) Work for better cooperation among the patchwork of agencies managing flood control issues.	INFR-d-17
7) Work cooperatively with upstream communities to monitor creek and watercourse flows to predict potential for flooding downstream.	
Strategies Applying to Landslide Hazards –	
While utilities actually install pipelines in landslide areas, cities and counties also have a role through their controls over development. For example, they can –	
1) Establish requirements in zoning ordinances to address hillside development constraints in areas of steep slopes that are likely to lead to excessive road maintenance or where roads will be difficult to maintain during winter storms due to landsliding.	INFR-e-2
Strategies Applying Public Education –	
Better cooperation is needed among cities, counties, and utilities to explain to the public the need for family emergency plans related to infrastructure outages. **Katrina was a disaster in part due to lack of communication – and miscommunication – with the public.**	
Examples include: 1) Electric power and natural gas outages 2) Travel delays due to road closures 3) Water supply contamination or shortages 4) Disruptions to sewer lines, wastewater treatment, or storm drains	INFR-g-1 INFR-g-2 INFR-g-3 INFR-g-4
It is important to facilitate and/or coordinate the distribution of educational materials that are prepared by others, such as by placing materials in city or utility newsletters, or on community access channels, as appropriate.	INFR-g-5

CREDITS – This pamphlet was prepared by J. Perkins, Earthquake and Hazards Program Manager, Association of Bay Area Governments (ABAG), using funding, in part, from FEMA for the development of the Bay Area Local Hazard Mitigation Plan. Photos – BBC–page 1 (right); Calif. OES–page 1 (left); NoeHill.com–page 3 (top); UC Berkeley–page 3 (bottom); PG&E–page 4 (bottom)

Infrastructure in Hazard Areas and Disasters – Risk Management and Public Policy Opportunities

Why worry?

The recent Hurricane Katrina Disaster on the Gulf Coast has reinforced existing knowledge on the role of infrastructure before and after disasters.
(1) Infrastructure, including roads and highways, ports and airports, pipelines carrying water, sewage, and natural gas, as well as power and communications systems are all tied together.
(2) Infrastructure is critical to a safe and resilient economy.
(3) The impacts of major catastrophes are not simply linearly related to the size of the impacted area, but rather can explode exponentially if infrastructure is impacted.
(4) People who are impacted if infrastructure is damaged are disproportionately the young, the elderly, and those with special needs.

These impacts are seen in most large earthquakes, as well. Emergency and utility repair vehicles were caught in the gridlock following the earthquake in Kobe, Japan.

Katrina Damage to Transportation

What can we do?

Cities, counties, and special districts, as part of their efforts to set priorities on various mitigation strategies contained in their Local Hazard Mitigation Plan annexes, should reexamine their priorities for infrastructure and how those priorities might need to be changed. This re-evaluation is particularly essential for those local governments without adopted plans, or with many of these strategies categorized as "under study" or "not yet considered."

Bay Area transportation and utility facilities and networks are vital lifelines during and following disasters, as well as in the functioning of our region and its economy.

Remember – it is far easier to try to get problems fixed before a disaster than to deal with numerous problems afterwards.

The strategies described on the following pages are applicable to any city or town – even those that do not run a utility.

Several of the strategies identified in the multi-jurisdictional Local Hazard Mitigation Plan can easily be undertaken by cities or counties at little or no cost, particularly in the case of strategies related to coordination with utilities.

For a full list of strategies, including those only applicable to local governments operating a utility, see the ABAG Local hazard Mitigation Plan at http://quake.abag.ca.gov/mitigation/plan.html.

Strategies Applying to Multiple Hazards –	Examples of Implementation
INFR-a-3 – Encourage the cooperation of utility system providers and cities, counties, and other special districts to develop strong and effective mitigation strategies for infrastructure systems and facilities.	A county public works department might establish a quarterly meeting with the cities and special districts within the county to discuss potential problems. Cities can form or participate in emergency managers groups.
INFR-a-5 – Support and encourage efforts of ***other*** (lifeline) agencies as they plan for and arrange financing for seismic retrofits and other disaster mitigation strategies. (For example, a city might pass a resolution in support of a transit agency's retrofit program.)	**ABAG** passed a resolution in support of **BART**'s retrofit program. **Sunnyvale** specifically worked with the **Santa Clara Valley Water District** to support its water reliability program.
INFR-a-7 – Engage in, support, and/or encourage research by others on measures to further strengthen transportation, water, sewer, and power systems so that they are less vulnerable to damage in disasters.	Research institutions such as USGS and local universities have opportunities for pilot programs. **Foster City** participates in the Quarterly Operations meetings with the **San Francisco Public Utilities Commission (SFPUC)** as it works on design.
INFR-a-8 – Pre-position emergency power generation capacity (or have rental/lease agreements for these generators) in critical buildings of cities, counties, and special districts to maintain continuity of government and services.	This strategy is an "existing program" of 28 of the 37 cities with draft or adopted plans.
INFR-a-9 – Have back-up emergency power available for critical intersection traffic lights.	This strategy is an "existing program" of 21 of the 37 cities with draft or adopted plans.
INFR-a-10 – Develop unused or new pedestrian rights-of-way as walkways to serve as additional evacuation routes (such as fire roads in park lands).	This strategy is an existing program of several city Park and Recreation Departments, including those of **Belmont**, **Portola Valley**, and **Sonoma**.
INFR-a-11 – Coordinate with PG&E and others to investigate ways of minimizing the likelihood that power interruptions will adversely impact vulnerable communities, such as the disabled and the elderly.	The **City of Alameda** has a "Disaster Registry" program to provide assistance to the special needs population.
INFR-a-12 – Encourage replacing aboveground electric and phone wires and other structures with underground facilities, and use the planning-approval process to ensure that all new phone and electrical utility lines are installed underground.	This strategy is an "existing program" of 32 of the 37 cities with draft or adopted plans. While it is unlikely to be funded by FEMA, it is still a valid mitigation program.
INFR-a-15 – Ensure that transit operators, private ambulance companies, cities, and/or counties have mechanisms in place for medical transport during and after disasters that take into consideration the potential for reduced capabilities of roads following these same disasters.	The **Santa Clara County Health Department Emergency Medical Services** has taken a leadership role in this area. The **City of Palo Alto** operates a full paramedic and transport program. **San Mateo County** has a county-wide JPA with a private ambulance provider.
INFR-a-16 – Effectively utilize the Transportation Management Center (TMC), the staffing of which is provided by Caltrans, the CHP and MTC. The TMC is designed to maximize safety and efficiency throughout the highway system. It includes the Emergency Resource Center (ERC) which was created specifically for primary planning and procedural disaster management.	Every city, county, and special district should plan on effectively utilizing information issued by TMC staff through **MTC** and media channels after a disaster to plan appropriate response and recovery activities given reduced transportation capabilities. **Thus, the priority for this strategy should be "existing" or "very high" for everyone.** There is no cost involved.
INFR-f-1 – Ensure that critical buildings owned or leased by special districts or private utility companies participate in a program similar to San Francisco's Building Occupancy Resumption Program (BORP).	The BORP program, developed by the **City and County of San Francisco**, permits owners of buildings to hire qualified structural engineers to create facility-specific post-disaster inspection plans and allows these engineers to become automatically deputized as City/County inspectors for these buildings in the event of an earthquake or other disaster. This program allows rapid reoccupancy of the buildings.

Strategies Applying to Earthquake Hazards –

Multi-Jurisdictional Local Hazard Mitigation Plan (LHMP) Policy Number

Earthquake damage to infrastructure can be expensive to repair, and thus mitigation can be particularly worthwhile. Several of the mitigation strategies apply to roads and public works facilities, so it is not necessary for a city or county to own its own water or sewer system to identify mitigation opportunities. For example –

1) Expedite the funding and retrofit of seismically-deficient city- and county-owned bridges and road structures by working with Caltrans and other appropriate governmental agencies. — INFR-b-1
When Caltrans funding was discontinued, the retrofit work on local bridges was stopped. Of the roughly 2,000 locally-owned bridges in the Bay Area, Caltrans identified 477 that needed retrofitting. Only 66 have been retrofitted. For a list of bridges needing work, see http://www.dot.ca.gov/hq/LocalPrograms/seispage/District4.PDF.
2) Establish a higher priority for funding seismic retrofit of existing transportation and infrastructure systems (such as BART) than for expansion of those systems. — INFR-b-2
3) Comply with all applicable building and fire codes, as well as other regulations (such as state requirements for fault, landslide, and liquefaction investigations in particular mapped areas) when constructing or significantly remodeling infrastructure facilities. — INFR-b-8
4) Clarify to workers in critical facilities and emergency personnel, as well as to elected officials and the public, whether the facilities are expected to perform only at a life safety level (allowing for the safe evacuation of personnel) or are expected to remain functional following an earthquake. — INFR-b-9

Strategies Applying to Wildfire Hazards –

Wildfires and ***wildland-urban-interface fires*** tend to occur in hillside areas where parklands border cities and towns. Cities, towns, and counties have a variety of ways to ensure that water is available to fight fires, as well as to improve access and evacuation routes in these hazard areas. While some are best implemented by fire districts, others may better be handled by planning, zoning, and public works –

1) Ensure a reliable source of water for fire suppression (meeting acceptable standards for minimum volume and duration of flow) for existing and new development. — INFR-c-1
2) Develop a coordinated approach between fire jurisdictions and water supply agencies to identify needed improvements to the water distribution system, initially focusing on areas of highest wildfire hazard. — INFR-c-2
3) Develop a defensible space vegetation program that includes the clearing or thinning of (a) non-fire resistive vegetation within 30 feet of access and evacuation roads and routes to critical facilities, or (b) all non-native species (such as eucalyptus and pine, but not necessarily oaks) within 30 feet of access and evacuation roads and routes to critical facilities. — INFR-c-3
4) Ensure all dead-end segments of public roads in high hazard areas have at least a "T" intersection turn-around sufficient for typical wildland fire equipment. — INFR-c-4
5) Enforce minimum road width of 20 feet with an additional 10-foot clearance on each shoulder on ***all*** driveways and road segments greater than 50 feet in length in wildfire hazard areas. — INFR-c-5
6) Require that development in high fire hazard areas provides adequate access roads (with width and vertical clearance that meet the minimum standards of the *Fire Code* or relevant local ordinance), onsite fire protection systems, evacuation signage, and fire breaks. — INFR-c-6
7) Ensure adequate fire equipment road or fire road access to developed and open space areas. — INFR-c-7
8) Maintain fire roads and/or public right-of-way roads and keep them passable at all times. — INFR-c-8